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Designing artificial phagocyte that selectively "ingests" solutes ALEXANDER ALEXEEV, KATHERINE C. POLHEMUS, AYUKO MORIKAWA, Georgia Institute of Technology — We use dissipative particle dynamics to design an active composite vesicle that can controllably and selectively "ingest" solutes from the surrounding fluid. The vesicle consists of a lipid membrane that envelops a stimuli-responsive microgel particle. When the microgel swells and increases in size due to an external stimulus, the lipid membrane breaks forming pores that expose a part of the microgel to the external solvent. Solutes initially dispersed in the solvent diffuse and bind to the uncovered surface of microgel particles. After the stimulus is removed and microgel deswells to its original size, the transmembrane pores close isolating the adsorbed solutes inside the vesicle. In our simulations, we formulate the criteria for the controlled pore opening and closing, and probe how this smart vesicle can be harnessed to "ingest" specific macromolecules. Our results will be useful for developing a new class of artificial phagocytes for targeted sampling in various biomedical applications.

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